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| 10/723,426   | 11/25/2003  | Hamid A. Toliyat     | 017575.0789 (TAMUS<br>1835) | 6244             |
| 5073   | 7590        | 05/02/2005           | EXAMINER                    |                  |
| BAKER BOTTS L.L.P.<br>2001 ROSS AVENUE<br>SUITE 600<br>DALLAS, TX 75201-2980 |             |                      | HORN, ROBERT WAYNE          |                  |
|  |             |                      | ART UNIT                    | PAPER NUMBER     |
|  |             |                      | 2837                        |                  |

DATE MAILED: 05/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/723,426

Applicant(s)

TOLIYAT ET AL.

Examiner

Robert W. Horn

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BM

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-20 is/are allowed.
- 6) ☒ Claim(s) 2-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

### ***Drawings***

New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because of the following informalities. Figure 1 does not show the return of energy from the windings to the Booster/Energy Storage Front End. Figure 2 does not show the connection, the dot, between lead 1 of 208 and lead 1 of 210, and lead 1 of 212. From the drawing it appears that transistor 208 is only connected to the plurality of diodes 206. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 2 is rejected under 35 U.S.C. 102(b) as being published by Krishnan, "Uninterruptible Motor Drives, A Case Study with Switched Reluctance Motors."

As regards claim 2, Krishnan teaches a unipolar drive, comprising:

a booster operable to increase a voltage received from a power supply to produce an energy output (page 222, section 2.3.1 and figure 6;

an energy storage module operable to store at least some of the energy output by the booster (C2 of figure 6); and

a unipolar inverter operable to energize windings of a motor using energy from the booster, wherein the unipolar inverter is further operable to return energy from the windings to the booster when windings are not being energized (page 223, figure 9, the C-dump converter returns energy to the booster in C-Dump mode.)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 3, 5, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barbehenn (US Pat. 5,583,421), and further in view of Guinet (US Pat. 6,014,001).

Barbehenn teaches the booster/energy storage combo as a single ended primary inductance converter in figure 1. Section 20 and component Cc1 form a circuit analogous to the inventor's booster shown in inventor's section 108, figures 2-3. Barbehenn's section 30 teaches an energy storage module analogous to the inventor's energy storage module. Barbehenn does not teach a unipolar inverter. Guinet teaches a unipolar inverter operable to energize windings of a motor using energy from the booster, wherein the unipolar inverter is further operable to return energy from the windings to the booster when windings are not being energized (figures 2, 4 and 6, the C-dump converter returns energy to the booster in C-Dump mode.)

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Conventional motor drive circuits are known to have problems with drawing power with poor power factor. The booster/energy storage module of Barbehenn could be fitted with the unipolar inverter of Guinet to generate the motor drive circuit of claim 2. One of ordinary skill in the art would have been motivated to combine the booster/energy storage combo of Barbehenn with the unipolar inverter of Guinet to create a circuit with an improved power factor and energy return from the windings.

As regards claim 3, Barbehenn teaches a booster that comprises: a transistor operable to receive a DC voltage; a capacitor coupled to the transistor; and an inductor coupled the transistor and the capacitor. Barbehenn does not teach a unipolar inverter. Guinet teaches a unipolar inverter operable to energize windings of a motor using energy from the booster, wherein the unipolar inverter is further operable to return energy from the windings to the booster when windings are not being energized (figures 2, 4 and 6, the C-dump converter returns energy to the booster in C-Dump mode.)

Conventional motor drive circuits are known to draw power with a poor power factor. The booster/energy storage module of Barbehenn could be fitted with the unipolar inverter of Guinet to generate the motor drive circuit of claim 3. One of ordinary skill in the art would have been motivated to combine the booster/energy storage combo of Barbehenn with the unipolar inverter of Guinet to create a circuit with an improved power factor and energy return from the windings.

As regards claim 5, the energy storage module of Barbehenn comprises: an inductor, a capacitor coupled to the inductor; and a diode coupled the capacitor and the booster operable carry energy from the capacitor to the booster. Barbehenn does not

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teach a unipolar inverter. Guinet teaches a unipolar inverter operable to energize windings of a motor using energy from the booster, wherein the unipolar inverter is further operable to return energy from the windings to the booster when windings are not being energized (figures 2, 4 and 6, the C-dump converter returns energy to the booster in C-Dump mode.) Conventional motor drive circuits are known to draw power with a poor power factor. The booster/energy storage module of Barbehenn could be fitted with the unipolar inverter of Guinet to generate the motor drive circuit of claim 8.

One of ordinary skill in the art would have been motivated to combine the booster/energy storage combo of Barbehenn with the unipolar inverter of Guinet to create a circuit with an improved power factor and energy return from the windings.

One of ordinary skill in the art would have been motivated to combine the booster/energy storage combo of Barbehenn with the unipolar inverter of Guinet to create a circuit with an improved power factor and energy return from the windings.

As regards claim 8, Guinet feature a unipolar inverter wherein power supply provides an AC voltage to the unipolar drive; and the unipolar drive further comprises a rectifier operable to transform the AC voltage into a DC voltage. Guinet does not teach a booster coupled to a energy storage module. Barbehenn teaches a booster coupled to an energy storage module. Conventional motor drive circuits are known to draw power with a poor power factor. The booster/energy storage module of Barbehenn could be fitted with the unipolar inverter of Guinet to generate the motor drive circuit of claim 8. One of ordinary skill in the art would have been motivated to combine the

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unipolar inverter of Guinet with the booster/energy storage combo of Barbehenn to create a circuit with an improved power factor and energy return from the windings.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mammano and further in view of and Guinet.

Mammano teaches a voltage comparator coupled to the booster, the voltage comparator operable to compare an output voltage the booster a reference voltage; and control the transistor of the booster based on the comparison. Mammano does not teach the unipolar inverter. Guinet teaches a unipolar inverter operable to energize windings of a motor using energy from the booster, wherein the unipolar inverter is further operable to return energy from the windings to the booster when windings are not being energized (figures 2, 4 and 6, the C-dump converter returns energy to the booster in C-Dump mode.) Conventional motor drive circuits are known to have problems with drawing power with poor power factor. The booster/energy storage module of Mammano could be fitted with the unipolar inverter of Guinet. One of ordinary skill in the art would have been motivated to combine the booster/energy storage combo of Mammano which includes a comparator operable to compare an output voltage the booster a reference voltage; and control the transistor of the booster based on the comparison with the unipolar inverter of Guinet to create a circuit with an improved power factor and energy return from the windings.

***Allowable Subject Matter***

Claims 6 and 7 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Claims 1, 9-20 allowed.

The following is a statement of reasons for the indication of allowable subject matter: Claims 1, 9-15 are allowed for the following reasons.

As regards claim 1, prior art teaches a combo of the booster and the energy storage module in combination with a voltage comparator for the control of the output of the booster. The combination is known in the art as a SEPIC front end. The SEPIC front is well known in the art of switching voltage power supplies and for its capacity to generate voltages that are greater and lesser than the input voltages. Separately, prior art teaches the unipolar inverter with diodes used for returning some of the unused energy from the motor windings. A second function of the diodes was to protect the switching transistors from the over voltage of the back electromotive force. The invention does more than combine boosting/ for the first time. The inventive concept is the coupling of the energy return diodes of the unipolar inverter to the booster/energy storage module in a novel, and not obvious way. Previously energy storage of the energy not used in the winding was in the form of charge accumulation in a capacitor. Storage of the energy returned from the motor winding in the present invention also includes storage in the inductor/capacitor tank circuit.



As regards claim 9 and the associated dependent claims 10-15, prior teaches a method for driving a motor, comprising: receiving a voltage input from a power supply; boosting the voltage received from the power supply; energizing windings of the motor using the boosted voltage; and storing at least some of the energy not used by the windings to excite the motor. Prior art does not teach, when the windings are not being energized, returning at least some of the energy stored in the windings to the booster. Again prior art teaches storage of the energy stored in the back electromotive force in the form of charge accumulation in a capacitor. Prior art does not teach the return of the energy to the booster.

As regards claim 16 and the associated dependent claims 17-20, prior art teaches a unipolar drive, comprising: a plurality of windings for a motor; a plurality of first transistors, each transistor coupled to one of the windings and operable to energize the respective winding; a plurality of first diodes, each diode coupled to one of the windings. Prior art also separately teaches the following: an energy storage module comprising a first capacitor, a first inductor, and a second diode; a booster coupled to the first diodes and the second diode, the booster comprising a second transistor, a second capacitor and a second inductor.

Prior art does not teach the following limitations of claim 16: a booster coupled to the first diodes and the second diode, the booster comprising a second transistor, a second capacitor and a second inductor "wherein the booster is operable to receive energy from the windings and the energy storage module using the first diodes and the

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second diode respectively." No references were found in prior art teaching this novel combination.

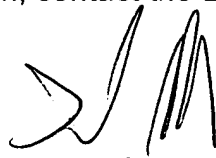
As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert W. Horn whose telephone number is 571-272-8591. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David S. Martin can be reached on 571-272-2107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
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